

NANDHA ENGINEERING COLLEGE

(An Autonomous Institution affiliated to Anna University Chennai and approved by AICTE, New Delhi)
Erode - 638 052, Tamilnadu, India, Phone: 04294 – 225585



Curriculum

for

B.Tech – Chemical Engineering [R26]

[CHOICE BASED CREDIT SYSTEM]

INSTITUTE VISION AND MISSION	
VISION	To be an Institute of excellence providing quality Engineering, Technology and Management education to meet the ever changing needs of the society
MISSION	- To provide quality education to produce ethical and competent professionals with social Responsibility - To excel in the thrust areas of Engineering, Technology and Entrepreneurship by solving real-world problems - To create a learner centric environment and improve continually to meet the changing global needs

B.Tech – CHEMICAL ENGINEERING	
VISION	To produce globally competent engineers in chemical engineering and allied disciplines to meet the growing needs of the society.
MISSION	- To develop skilled and employable graduates to meet the challenges in emerging fields of Engineering and Technology. - To prepare the students for prosperous career in Engineering and Entrepreneurship by inculcating the leadership qualities with professional and ethical responsibilities for the benefit of the society - To provide learner centric environment by imparting quality education to cater the needs of the society
PROGRAMME EDUCATIONAL OBJECTIVES (PEO)	The graduates of Chemical Engineering will be PEO1: Core Competency: Successful professionals with core competency and inter-disciplinary skills to satisfy the Industrial needs PEO2: Research, Innovation and Entrepreneurship: Capable of identifying technological requirements for the society and providing innovative ideas for real time problems PEO3: Ethics, Human values and Life-long learning: Able to demonstrate ethical practices and managerial skills through continuous learning
PROGRAMME SPECIFIC OUTCOMES (PSO)	The students of Chemical Engineering will be able to PSO1: Identify, formulate and analyze the problems of chemical engineering systems and product development. PSO2: Implement appropriate engineering tools for modeling, simulation, analysis and optimization of chemical processes.

PROGRAM OUTCOMES:

Engineering Graduates will be able to:

a-k	GRADUATE ATTRIBUTES	PO No.	PROGRAMME OUTCOMES
a	Engineering knowledge	PO1	Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
b	Problem Analysis	PO2	Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
c	Design/ Development of Solutions	PO3	Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
d	Conduct Investigations of Complex Problems	PO4	Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8)
e	Engineering Tool Usage	PO5	Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
f	The Engineer and The World	PO6	Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7)
g	Ethics	PO7	Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
h	Individual and Collaborative Team Work	PO8	Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
i	Communication	PO9	Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
j	Project Management and Finance	PO10	Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
k	Life-Long Learning	PO11	Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

SEMESTER: I									
S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	COURSE TYPE	TEACHING AND LEARNING SCHEME			CREDITS	TCP
					L	T	P		
1	26MAN01	Induction Programme	M						
2	26MYB01	Linear Algebra and Applied Calculus	BS	T	3	1	0	4	4
3	26CYB01	Applied Chemistry	BS	LIT	2	0	2	3	4
4	26GYA01	தமிழர் மரபு / Heritage of Tamils	HUM	T	1	0	0	1	1
5	26ADC02	Problem Solving and Python Programming	ES (G)	LIT	2	0	3	4	5
6	26MEC01	Engineering Drawing and Graphics	ES (G)	LIT	3	0	2	4	5
7	26CHC01	Introduction to Chemical Engineering	ES (PC)	T	3	0	0	3	3
8	26EYP01	English Communication Lab	HUM	L	0	0	4	2	4
9	26GEP02	Makerspace	SD	L	0	0	4	2	4
10	26GYP01	Yoga for Youth Empowerment	HUM	L	0	0	2	1	2
TOTAL					14	1	17	24	32

SEMESTER: II									
S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	COURSE TYPE	TEACHING AND LEARNING SCHEME			CREDITS	TCP
					L	T	P		
1	26MYB02	Fourier Analysis and Partial Differential Equations	BS	T	3	1	0	4	4
2	26PYB03	Applied Physics for Industrial Systems	BS	T	3	0	0	3	3
3	26GYA02	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	HUM	T	1	0	0	1	1
4	26CYB04	Climate Change and Sustainability	HUM	T	2	0	0	2	2
5	26EEC03	Basics of Electrical and Electronics Engineering	ES (G)	T	3	0	0	3	3
6	26CHC02	Chemical Process Industries	ES (PC)	T	3	0	0	3	3
7	26EYP02	English Proficiency Lab	HUM	L	0	0	2	1	2
8	26PYP01	Physics Laboratory	BS	L	0	0	2	1	2
9	26GEP01	Foundation Laboratory	SD	L	0	0	4	2	4
10	26GEP03	Life Skills for Engineers	ES(G)	-	1	0	2	1	3
11	26GEA01	Analytical Skills - I	ES(G)	T	2	0	0	1	2
TOTAL					18	1	10	22	29

SEMESTER: III									
S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	COURSE TYPE	TEACHING AND LEARNING SCHEME			CREDITS	TCP
					L	T	P		
1	XXXX	Probability, Statistics and Numerical Techniques	BS	T	3	1	0	4	4
2	XXXX	Industrial Chemistry	ES (PC)	LIT	3	0	2	4	5
3	XXXX	Fluid Mechanics	ES (PC)	LIT	3	0	2	4	5
4	XXXX	Chemical Process Calculations	ES (PC)	T	2	1	0	3	3
5	XXXX	Material Technology	ES (PC)	T	3	0	0	3	3
6	XXXX	Process Safety Management	ES (PC)	T	3	0	0	3	3
7	XXXX	English Competency Lab	HUM	L	0	0	2	1	2
8	XXXX	Disaster Management and Preparedness	M	T	2	0	0		2
9	XXXX	Analytical Skills - II	ES(G)	T	2	0	0	1	2
10	XXXX	Design Thinking	ES(G)	T	2	0	0	2	2
TOTAL					23	2	6	25	31

SEMESTER: IV									
S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	COURSE TYPE	TEACHING AND LEARNING SCHEME			CREDITS	TCP
					L	T	P		
1	XXXX	Introduction to AI and ML for Chemical Engineers	ES(G)	T	2	0	0	2	2
2	XXXX	Instrumental Methods of Analysis	BS	T	3	0	0	3	3
3	XXXX	Mechanical Operations	ES (PC)	LIT	3	0	2	4	5
4	XXXX	Process Heat Transfer	ES (PC)	LIT	3	0	2	4	5
5	XXXX	Mass Transfer - I	ES (PC)	T	3	0	0	3	3
6	XXXX	Chemical Engineering Thermodynamics	ES (PC)	T	3	0	0	3	3
7	XXXX	Workplace English Lab	HUM	L	0	0	2	1	2
8	XXXX	Analytical Skills - III	ES(G)	T	2	0	0	1	2
9	XXXX	Micro Project	SD	PW	0	0	4	2	4
10	XXXX	Personality and Character Development	SD	-	0	0	1		1
TOTAL					19	0	11	23	30

SEMESTER: V									
S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	COURSE TYPE	TEACHING AND LEARNING SCHEME			CREDITS	TCP
					L	T	P		
1	XXXX	Introduction to Standards in Chemical Engineering	ES (PC)	T	1	0	0	1	1
2	XXXX	Chemical Reaction Engineering - I	ES (PC)	T	3	0	0	3	3
3	XXXX	Mass Transfer - II	ES (PC)	LIT	3	0	2	4	5
4	XXXX	Process Dynamics and Control	ES (PC)	LIT	3	0	2	4	5
5	XXXX	Elective I	ES (PE)	T	3	0	0	3	3
6	XXXX	Elective II	ES (PE)	T	3	0	0	3	3
7	XXXX	Elective III	ES (PE/OE)	T	3	0	0	3	3
8	XXXX	Process Computation Laboratory	ES (PC)	P	0	0	2	1	2
9	XXXX	Indian Knowledge System	M	T	2	0	0		2
TOTAL					21	0	6	22	27

For Honours									
S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	COURSE TYPE	TEACHING AND LEARNING SCHEME			CREDITS	TCP
					L	T	P		
1	XXXX	Capstone Design Project – Level I	SD	GDP	0	0	12	6	12
OR									
1	XXXX	Honours Elective – I		T	3	0	0	3	3
2	XXXX	Honours Elective – II		T	3	0	0	3	3
For Minors									
1	XXXX	Minor Elective – I		T	3	0	0	3	3
2	XXXX	Minor Elective – II		T	3	0	0	3	3

SEMESTER: VI									
S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	COURSE TYPE	TEACHING AND LEARNING SCHEME			CREDITS	TCP
					L	T	P		
1	XXXX	Innovation, Start-up and Entrepreneurship	HUM	LIT	2	0	2	3	4
2	XXXX	Transport Phenomena	ES (PC)	T	3	0	0	3	3
3	XXXX	Chemical Reaction Engineering - II	ES (PC)	LIT	3	0	2	4	5
4	XXXX	Process Equipment Design	ES (PC)	LIT	3	0	2	4	5
5	XXXX	Elective IV	ES (PE)	T	3	0	0	3	3
6	XXXX	Elective V	ES (PE)	T	3	0	0	3	3
7	XXXX	Elective VI	ES (PE/OE)	T	3	0	0	3	3
8	XXXX	Mini Project	SD	PW	0	0	4	2	4
TOTAL					20	0	10	25	30

For Honours									
S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	COURSE TYPE	TEACHING AND LEARNING SCHEME			CREDITS	TCP
					L	T	P		
1	XXXX	Capstone Design Project – Level II	SD	GDP	0	0	12	6	12
OR									
1	XXXX	Honours Elective – III		T	3	0	0	3	3
2	XXXX	Honours Elective – IV		T	3	0	0	3	3
For Minors									
1	XXXX	Minor Elective – III		T	3	0	0	3	3
2	XXXX	Minor Elective – IV		T	3	0	0	3	3

SEMESTER: VII									
S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	COURSE TYPE	TEACHING AND LEARNING SCHEME			CREDITS	TCP
					L	T	P		
1	XXXX	Process Modeling and Simulation	ES (PC)	LIT	3	0	2	4	5
2	XXXX	Process Engineering Economics	ES (PC)	T	3	0	0	3	3
3	XXXX	Elective VII	ES (PE)	T	3	0	0	3	3
4	XXXX	Elective VIII	ES (PE)	T	3	0	0	3	3
5	XXXX	Elective IX	ES (OE)	T	3	0	0	3	3
6	XXXX	Internship/ Industrial Training	SD	L	0	0	4	2	4
7	XXXX	Design Project	SD	PW	0	0	4	2	4
8	XXXX	Research Paper Writing^	M	-	0	0	2	-	2
TOTAL					15	0	12	20	27

^ Audit Course

For Honours									
S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	COURSE TYPE	TEACHING AND LEARNING SCHEME			CREDITS	TCP
					L	T	P		
1	XXXX	Capstone Design Project – Level III	SD	GDP	0	0	12	6	12
OR									
1	XXXX	Honours Elective – V		T	3	0	0	3	3
2	XXXX	Honours Elective – VI		T	3	0	0	3	3
For Minors									
1	XXXX	Minor Elective – V		T	3	0	0	3	3
2	XXXX	Minor Elective – VI		T	3	0	0	3	3

SEMESTER: VIII									
S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	COURSE TYPE	TEACHING AND LEARNING SCHEME			CREDITS	TCP
					L	T	P		
1	XXXX	Project Work / Internship cum Project Work	SD	PW	0	0	16	8	16
TOTAL					0	0	16	8	16

Credit Distribution of Courses

Semester/ Category	BS	HUM	ES(G)	ES(PC)	ES(PE)	ES(PE/OE)	ES(OE)	SD	SL	M	Total
Sem I	7	4	8	3	0	0	0	2	0	0	24
Sem II	8	4	5	3	0	0	0	2	0	0	22
Sem III	4	1	3	17	0	0	0	0	0	0	25
Sem IV	3	1	3	14	0	0	0	2	0	0	23
Sem V	0	0	0	13	6	3	0	0	0	0	22
Sem VI	0	3	0	11	6	3	0	2	0	0	25
Sem VII	0	0	0	7	6	0	3	4	0	0	20
Sem VIII	0	0	0	0	0	0	0	8	0	0	8
Total	22	13	19	68	18	6	3	20	0	0	169
% Credit Distribution	13.0	7.7	11.2	40.2	10.7	3.6	1.8	11.8	0.0	0.0	100

INDUCTION PROGRAMME (Common to All Branches)							
Course Code:					CIA	-	
Course Type: (Theory/Practical/Integrated)					ESE	-	
L:T:P:C	0	0	0	0	Total Marks	Nil	
Total Hours of Pedagogy	2 Weeks				Exam Hours	-	
Prerequisite	Nil						
Course Objectives							
1. To recognize the importance of holistic development, professional ethics, human values, and social responsibility in engineering education. 2. To develop positive interpersonal relationships, adapt effectively to the academic environment and participate responsibly in institutional and societal activities.							
Course Outcomes The students will be able to					Cognitive Level	Weightage of COs in ESE	
CO 1	Explain the objectives of the Induction Programme and the role of engineering in addressing societal and national needs.				U	-	
CO 2	Demonstrate self-discipline, healthy lifestyle practices, and awareness of universal human values in day-to-day activities.				Ap		
CO 3	Participate effectively in creative, literary, physical, and department-specific activities to enhance personal and professional skills.				Ap		
CO 4	Analyze the significance of teamwork, communication, and ethical behavior in building positive relationships within the institution and society.				An		
CO 5	Develop innovative ideas and create simple solutions or models through department-specific activities, fostering creativity and a maker mindset.				C		

Mapping of COs with POs / PSOs													
COs	POs											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 1						3	2				3		
CO 2						2	3	2	3	2	3		
CO 3							2	3	3	2	3		
CO 4						2	3	3	3	2	3		
CO 5						1		2	3	2	3		
CO (W.A)						2	3	3	3	2	3		

(i) Physical Activity

This would involve a daily routine of physical activity with games and sports, yoga, gardening, etc.

(ii) Creative Arts

Every student would choose one skill related to the arts, whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance, etc. The student would pursue it every day for the duration of the programme. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, grow into engineering design later.

(iii) Universal Human Values

This is the anchoring activity of the Induction Programme. It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting stay in the hostel and department, be sensitive to others, etc. A module in Universal Human Values provides the base. Methodology of teaching this content is extremely important. It must not be through do's and don'ts, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing.

Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It would be effective that the faculty mentor assigned is also the faculty advisor for the student for the full duration of the UG programme.

(iv) Literary Activity

Literary activity would encompass reading, writing and possibly, debating, enacting a play, etc.

(v) Proficiency Modules

This would address some lacunas that students might have, for example, English, computer familiarity, etc.

(vi) Lectures by Eminent People

Motivational lectures by eminent people from all walks of life should be arranged to give the students exposure to people who are socially active or in public life.

(vii) Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

(viii) Familiarization to Dept./Branch & Innovations

They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

(ix) Department Specific Activities

About a week can be spent in introducing activities (games, quizzes, social interactions, small experiments, design thinking, etc.) that are relevant to the particular branch of Engineering/Technology/Architecture that can serve as a motivation and kindle interest in building things (become a maker) in that particular field. This can be conducted in the form of a workshop. For example, CSE and IT students may be introduced to activities that kindle computational thinking, and get them to build simple games. ECE students may be introduced to building simple circuits as an extension of their knowledge in Science, and so on. Students may be asked to build stuff using their knowledge of science.

Induction Programme is totally an activity based programme and therefore there shall be no tests /

assessments during this programme.
Total (2 weeks)

References Guide to Induction program from AICTE
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Linear Algebra and Applied Calculus (Common to All)

Course Code:	26MYB01				CIA	40
Course Type: (Theory/Practical/Integrated)	Theory				ESE	60
L:T:P:C	3	1	0	4	Total Marks	100
Total Hours of Pedagogy	60				Exam Hours	3
Pre-requisites	Nil					
Course Objectives						
1. To provide fundamental knowledge of Linear Algebra, Calculus, and Differential Equations to develop problem-solving skills for engineering and scientific applications. 2. To develop analytical skills in multivariable functions, optimization, vector calculus, and multiple Integrals for solving engineering problems involving area and volume.						
Course Outcomes					Cognitive Level	Weightage of COs in ESE
CO 1	Apply the concepts of eigen values, eigen vectors, and the Cayley–Hamilton theorem to solve matrix-related problems.				Ap	20
CO 2	Analyze single and multivariable functions using limits, continuity, derivatives, and optimization techniques.				An	20
CO 3	Evaluate double and triple integrals to determine area and volume.				Ap	20
CO 4	Compute higher order linear differential equations using analytical methods.				Ap	20
CO 5	Apply vector calculus concepts and integral theorems in engineering and physical applications.				Ap	20

Mapping of COs with POs / PSOs

COs	POs											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 1	3				2						2		
CO 2		3			2						2		
CO 3	3				2						2		
CO 4	3				2						2		
CO 5	3				2						2		
CO (W.A)	3	3			2						2		

Unit- I : Linear Algebra	(9+3) Hours
Eigen values and Eigen vectors of a real matrix- Properties of Eigen values and Eigen vectors (without proof)- Cayley Hamilton Theorem (excluding proof) and its applications.	
Unit- II : Calculus of Single and Several Variables	(9+3) Hours
Limit of a function, Continuity, Limits at infinity, Maxima and Minima of functions of single variable, Mean value theorem - Partial derivatives-Total Derivative-Euler's theorem on homogeneous function- Maxima and Minima of functions of two variables.	
Unit- III : Multiple Integration in Cartesian Coordinates	(9+3) Hours
Double integration in Cartesian Co-ordinates-Change of order of integration-Area as double integral- Triple Integration in Cartesian Co-ordinates-Volume as triple integrals.	
Unit- IV : Linear Differential Equations of Second Order	(9+3) Hours
Higher order linear differential equations with constant coefficients - Method of variation of parameters - Cauchy's and Legendre's linear equations.	
Unit- V : Vector Differentiation and Integration	(9+3) Hours
Divergence and Curl – Irrotational and solenoidal vector fields – Line integral over a plane curve – Surface integral and volume integral - Green's, Gauss divergence Theorem (Excluding Proofs) and Stokes Theorem(Excluding Proofs).	
Total (L+T : 60)	

Suggested Learning Resources
Text Books :
1. Erwin Kreyszig, Advanced Engineering Mathematics, 11th Edition, Wiley India, 2025.
2. B.S. Grewal, Higher Engineering Mathematics, 45th Edition, Khanna Publishers, 2023.
Reference Books:
1. H.K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, 3 rd Revised Edition, S. Chand Publishing, 2023.
2. T.K.V. Iyengar, B. Krishna Gandhi, S. Ranganatham and M.V.S.S.N. Prasad, Engineering Mathematics, Volume I & II, S. Chand Publishing, 2022.
3. N.P. Bali and Manish Goyal, A Textbook of Engineering Mathematics, Laxmi Publications, 2019.
4. B. V. Ramana, <i>Higher Engineering Mathematics</i> , 11th Edition, McGraw Hill Education, 2017 .
5. Gilbert Strang, <i>Linear Algebra and Its Applications</i> , 4th Edition (Indian Reprint), Cengage Learning, 2022 .

APPLIED CHEMISTRY (Common to ECE, EEE, CIVIL, CHEMICAL and MECH)							
Course Code:		26CYB01			CIE		50
Course Type: (Theory/Practical/Integrated)		Integrated			ESE		50
L:T:P:C		2	0	2	3	Total Marks	100
Total Hours of Pedagogy		45 (L : 30 + P : 15)			Exam Hours		3 HOURS
Pre-requisites		NIL					
Course Objectives							
- To enable students to apply core concepts in water treatment, electrochemistry, energy storage devices, and corrosion science to solve real-world engineering problems. - To equip students with knowledge of analytical techniques, nanomaterials, and polymer processing to develop and evaluate solutions in materials science, chemical analysis, and energy systems.							
Course Outcomes						Cognitive Level	Weightage of COs in ESE
CO 1	Apply water treatment methods for domestic and industrial applications.					Ap	20%
CO 2	Assess electrochemical systems, batteries, fuel cells, and fuel technologies for engineering applications.					E	40%
CO 3	Analyze corrosion types and corrosion control methods.					An	20%
CO 4	Examine analytical techniques and nanomaterial applications in chemical and material sciences.					An	20%
CO 5	Apply concepts of batteries, corrosion, polymers, water treatment, and analytical techniques to develop a mini-project for real-world applications.					Ap	Internal Assessment

Mapping of COs with POs / PSOs													
COs	POs											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 1	2										3		
CO 2			2			2							
CO 3		2				2							
CO 4	2										3		
CO 5	2					2							
CO (W.A)	2	2	2			2					3		

UNIT- I : WATER TREATMENT	6
Hardness - temporary hardness - permanent hardness - Municipal water treatment - disinfection methods - UV - ozonation - chlorination - desalination of brackish water - reverse osmosis - boiler troubles - scale - sludge - caustic embrittlement - treatment of boiler feed water - internal treatment - carbonate - phosphate - calgon conditioning - external treatment - demineralization process - importance and applications of AI in water treatment.	
UNIT- II : ELECTROCHEMISTRY AND POLYMER SCIENCE	6
Electrode potential - Nernst equation - derivation and problems - reference electrodes - calomel electrode - glass electrode. Polymers - classification - addition - condensation - copolymerization - engineering plastics - preparation - properties - uses of PVC and nylon - polymer processing - compression - injection moulding techniques.	
UNIT- III : ENERGY STORAGE SYSTEMS AND FUEL SCIENCE	6
Batteries - types of batteries - lead acid storage battery - lithium ion battery - flow battery - hydrogen - oxygen fuel cell- electric vehicles - working principles. Fuels - analysis of coal - proximate analysis - metallurgical coke - manufacture by Otto-Hoffmann method - manufacture of synthetic petrol - Bergius process.	
UNIT- IV : PROTECTIVE COATINGS IN CORROSION SCIENCE	6
Corrosion - types - chemical corrosion - mechanism - electrochemical corrosion - mechanism - factors influencing corrosion - corrosion control - sacrificial anodic protection method - protective coatings - paints - constituents and functions - metallic coatings - electroplating and electroless plating.	
UNIT- V : ANALYTICAL METHODS AND NANO CHEMISTRY	6
Colorimetry - principles- estimation of Iron by colorimetry - UV-Visible spectroscopy- principles - instrumentation (block diagram only) - IR spectroscopy - principles - instrumentation (block diagram only) - Atomic absorption spectroscopy - principles - instrumentation (block diagram only) - estimation of nickel by atomic absorption spectroscopy. Nanomaterials - carbon nanotubes - synthesis - laser ablation - chemical vapour deposition method - applications of CNTs.	
List of Experiments:	15 Hours
1. Determination of the hardness of water sample by EDTA method. 2. Determination of alkalinity in water sample. 3. Conductometric titration using barium chloride and sodium sulphate. 4. Estimation of iron content of the given solution using potentiometer. 5. Determination of strength of given hydrochloric acid using pH meter.	
Total (L : 30 + P : 15)	

Suggested Learning Resources

Text Books :

1. Dr.Ravikrishnan A., "Applied Chemistry - II", First Edition, Sri Krishna Hitech Publishing Company Pvt. Ltd., Chennai, 2025.
2. S.S. Dara," A text book of Engineering Chemistry", S.Chand & Co. Ltd. New Delhi, 2024.

Reference Books:

1. Jain P C. and Monica Jain, "Engineering Chemistry", Volume I and II, 17th Edition, Dhanpat Rai Publishing Company, New Delhi 2025.
2. Jaya Shree Anireddy, "Text book of Engineering Chemistry", John Wiley & Sons (India) Private Limited, New Delhi, 2023.
3. B. Sivasankar, *Engineering Chemistry*, 3rd Edition, McGraw Hill Education (India) Pvt. Ltd., New Delhi, 2023.
4. William D. Callister Jr. and David G. Rethwisch, *Callister's Materials Science and Engineering*, 11th Edition, John Wiley & Sons, Hoboken, NJ, 2024.
5. M. N. Boraste, *Nanomaterials: Principles and Applications*, CRC Press, Taylor & Francis Group, Boca Raton, Florida, 2022.

தமிழர்மரபு - HERITAGE OF TAMILS (Common to all branches)

Course Code:	26GYA01				CIA	40
Course Type: (Theory/Practical/Integrated)	Theory				ESE	60
L:T:P:C	1	0	0	1	Total Marks	100
Total Hours of Pedagogy	15				Exam Hours	3
Prerequisite	Nil					

பாடத்திட்டத்தின் நோக்கம் :

பழந்தமிழரிடம் இருந்த அறம், இசை, கலை நுட்பம், வாணிபம், கட்டுமானம், மருத்துவம், வீரம், வாழ்வுமுறை இவற்றை மாணவர்களுக்கு உணர்த்துவது.

Course Outcomes The students will be able to		Cognitive Level	Weightage of COs in ESE
CO1	தமிழ்மொழியின் தொன்மை, பகுத்துண்டு வாழ்தல், மேலாளருக்கான தகுதிகள், மாணவர்களின் தனித்திறனை வளர்த்தல்.	R	20%
CO2	பண்பாட்டு விழுமியங்கள், மனிதவளம், நம்பிக்கைகள் ஆகியவற்றை அறிதல்.	U	20%
CO3	குழு மனப்பான்மை, கலை நுட்பங்கள், இசை வடிவங்களை அறிதல்.	U	20%
CO4	வாணிபத் தொடர்பு, ஒழுக்க கோட்பாடுகள், சமூகத் தொடர்பு இவற்றை அறிதல்.	R	20%
CO5	பழந்தமிழரின் வீரம், மருத்துவ முறைகள், தமிழ் பிராமிய எழுத்து வடிவங்கள் ஆகியவற்றை அறிதல்.	An	20%

அலகு 1 - மொழிமற்றும் இலக்கியம்	3
திராவிடமொழிகள் - தமிழ்ஒருசெம்மொழி - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம்-திருக்குறளில் மேலாண்மை கருத்துக்கள் - இக்கால இலக்கியங்கள்	
அலகு 2 -பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை	3
நடுகல் முதல் நவீன சிற்பங்கள் வரை-பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள் - தேர்- குமரிமுனையில் திருவள்ளுவர் சிலை - இசைக்கருவிகள் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு	
அலகு 3 - நாட்டுப் புறக்கலைகள் மற்றும் வீரவிளையாட்டுகள்.	3
தெருக்கூத்து - கரகாட்டம் - வில்லுப்பாட்டு - ஓயிலாட்டம் - தோல் பாவை கூத்து - சிலம்பாட்டம் - வளரி - தமிழர்களின் விளையாட்டுகள்	
அலகு 4 -தமிழர்களின் திணைக்கோட்பாடுகள்	3

தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக்கோட் பாடுகள்-சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும் கல்வியும்-சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி	
அலகு 5 -இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு.	3
இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில் சித்தமருத்துவத்தின் பங்கு - கல்வெட்டுக்கள் - ஓலைச் சுவடிகள்	
TOTAL(L:15)	

Suggested Learning Resources
Text Books – CUM- Reference Books
1. கே.கே.பிள்ளை – தமிழக வரலாறு – மக்களும் பண்பாடும்-வெளியீடு தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம். 2. முனைவர் இல.சுந்தரம் – கணினித் தமிழ் – விகடன் பிரசுரம் 3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம்-தொல்லியல்துறை வெளியீடு 4. பொருநை – ஆற்றங்கரை நாகரிகம் - தொல்லியல்துறை வெளியீடு 5. Dr.K.K.Pillay - Social life of Tamils, A join publication of TNTB & ESC and RMRL - (in print) 6. Dr.K.K.Pillay - Studies in the History of India with special reference to Tamil Nadu.(Published by: The Author) 7. Keeladi – ‘Sangam City Civilization on the Banks of River Vaigai’ (Jointly published by : Department of Archaeology& Tamil Nadu Text Book and Educational Service Corporation, Tamilnadu) 8. Dr. S. V. Subrahmanian, Dr.K.D. Thirunavvukarasu - Historical Heritage of Tamils - Published by : International Institute of Tamil Studies

PROBLEM SOLVING AND PYTHON PROGRAMMING							
(Common to Agri, Civil, Chem, Mech Branches)							
Course Code:		26ADC02				CIE	50
Course Type: (Theory/Practical/Integrated)		Integrated				ESE	50
L:T:P:C		3	0	2	4	Total Marks	100
Total Hours of Pedagogy		75 (L : 45 + P : 30)				Exam Hours	3 Hours
Pre-requisites		Nil					
Course Objectives							
To provide students with fundamental Python programming skills for developing computational thinking and problem-solving abilities, and to apply Python libraries for engineering applications.							
Course Outcomes						Cognitive Level	Weightage of COs in ESE
CO 1	Develop algorithmic solutions for basic computational problems using Python fundamentals.					AP	20%
CO 2	Apply Python syntax, data types, and control flow constructs to develop programs for solving basic computational tasks.					AP	20%
CO 3	Apply compound data structures such as strings, lists, tuples, sets, and dictionaries to organize and process sequential data efficiently.					AP	20%
CO 4	Implement file handling operations to manage data input and output in programs.					AP	20%
CO 5	Design and analyze data-driven solutions using NumPy, Pandas, and Matplotlib to clean, filter, and visually explore datasets.					An	20%

Mapping of COs with POs / PSOs													
COs	POs											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 1	3	3	3	2							3		
CO 2	3	3	3	2							3		
CO 3	3	3	3	2							3		
CO 4	3	3	3	2							3		
CO 5	3	3	3	2	3						3		
CO (W.A)	3	3	3	2	3						3		

Unit- I : ALGORITHMIC PROBLEM SOLVING AND PYTHON FUNDAMENTALS	9
Problem Solving, Problem Analysis Chart, Developing an Algorithm, Flowchart and Pseudocode, Interactive and Script Mode, Indentation, Comments, Error messages, Variables, Reserved Words, Data Types, Arithmetic operators and expressions, Built-in Functions, Importing from Packages.	
Unit- II : Control Structures and functions	9
if, if-else, nested if, multi-way if-elif statements, while loop, for loop, break, continue, nested loops, pass statements. Functions-Introduction to Functions-Defining and Calling Functions-Function Arguments and Return Values-Scope of Variables-Recursive Functions	
Unit- III :Strings & Collections	9
String Comparison, Formatting, Slicing, Splitting, Stripping, Lists, tuples, and dictionaries, basic list operators, searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values.	
Unit- IV : File Operations	9
Create, Open, Read, Write, Append and Close files. Manipulating directories, OS and Sys modules, reading/writing text and numbers, from/to a file; creating and reading a formatted file (csv, tab-separated, etc.) - File Pointer Methods (seek() and tell())	
Unit- V : MODULES, PACKAGES	9
Introduction to Modules-Importing Modules using import and from...import-Standard Library Modules-math-random-date time-Creating and Using User-Defined Modules-Introduction to Packages-Accessing Modules from Packages-NumPy: Creating Arrays and Basic Array Operations-Matplotlib: Data Visualization-Line Plots-Bar Charts-Scatter Plots	
List of Experiments:	30 Hours
1. Programs using operators and input/output statements. 2. Programs using conditional and looping constructs (if, for, while) 3. Programs using user-defined and recursive functions 4. Programs using string operations and formatting 5. Programs using lists, tuples, and dictionaries 6. Programs involving file handling operations (reading, writing, appending, seek(), tell()) 7. Programs using standard library modules, user-defined modules, and packages 8. Program to create and perform basic operations on NumPy arrays 9. Programs to visualize data using Matplotlib (Line, Bar, and Scatter plots)	
Total (L : 45 + P :30)	

Suggested Learning Resources
Text Books: 1. Reema Thareja <i>Python Programming: Using Problem Solving Approach</i>, 3rd Edition, Oxford University Press(2025) 2. R. Nageswara Rao, <i>Core Python Programming</i>, 3rd Edition, Dream tech Press, New Delhi, 2021
Reference Books: 1. Y. Daniel Liang, <i>Introduction to Programming Using Python</i>, 1st Edition, Pearson Education, 2012. 2. Charles Dierbach, <i>Introduction to Computer Science Using Python: A Computational Problem-Solving Focus</i>, 1st Edition, Wiley India, 2013. 3. John V. Guttag, <i>Introduction to Computation and Programming Using Python: With Application to Computational Modeling</i>, 3rd Edition, MIT Press, 2021. 4. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016. 5. Eric Matthes, <i>Python Crash Course: A Hands-On, Project-Based Introduction to Programming</i>, 3rd Edition, No Starch Press, 2023.

ENGINEERING DRAWING AND GRAPHICS

(Common to Agri, Chemical, Civil, EEE and Mechanical Engineering)

Course Code:	26MEC01	CIE	50
Course Type: (Theory/Practical/Integrated)	Integrated	ESE	50
L:T:P:C	3 0 2 4	Total Marks	100
Total Hours of Pedagogy	75 (L : 45 + P : 30)	Exam Hours	3 Hrs
Pre-requisites	Nil		

Course Objectives

To impart knowledge of BIS standards and develop skills in engineering drawing, projections, sectioning of solids, and CAD-based orthographic and isometric drawings.

Course Outcomes		Cognitive Level	Weightage of COs in ESE
The students will be able to			
CO 1	Apply engineering drawing standards to construct 2D plane curves and conic sections.	Ap	20%
CO 2	Apply the principles of first angle projection to solve and draw projection problems involving lines and planes.	Ap	20%
CO 3	Construct projections of simple solids inclined to principal planes using the rotating object method.	Ap	20%
CO 4	Develop sectional views and lateral surfaces of solids for manufacturing applications.	Ap	20%
CO 5	Generate orthographic/isometric drawings and dimensioning as per BIS/ISO standards.	An	20%

Mapping of COs with POs / PSOs

COs	POs											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 1	3							2					2
CO 2	3							2					2
CO 3	3		3					2					2
CO 4	3	3	2					2					2
CO 5	3	2	3		3			2			3		2
CO (W.A)	3	2.5	2.67		3			2			3		2

CONCEPTS AND CONVENTIONS (Not for Examination)	
Importance of graphics in engineering applications - use of drafting instruments - BIS conventions and specifications - size, layout and folding of drawing sheets – types of lines, lettering and dimensioning – scales – title block.	
Unit- I : PLANE CURVES	9
Basic geometrical constructions of conics - Ellipse, parabola and hyperbola by eccentricity method - construction of cycloid - drawing of tangents and normal to the above curves.	
UNIT-II : PROJECTION OF POINTS, LINES AND PLANES	9
Introduction to theory of projection –first angle and third angle projection. Principal planes - first angle projection - projection of points - projection of straight lines inclined to both the principal planes - determination of true lengths and true inclinations by rotating line method - projection of planes (polygonal and circular surfaces).	
UNIT-III : PROJECTION OF SOLIDS	9
Projection of simple solids - prism, pyramid, cylinder and cone when the axis is inclined to anyone of the principal plane and parallel to the other plane by rotating object method.	
Unit - IV : SECTION OF SOLIDS AND DEVELOPMENT OF SURFACE	9
Sectioning of solids (prism, pyramid, cylinder and cone) in simple vertical position when the cutting plane is inclined to the one of the principal plane and perpendicular to the other plane - development of lateral surfaces of sectioned solids - prism, pyramid, cylinder and cone.	
UNIT V : ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS	9
Principles of isometric projection - isometric scale - isometric projections of lines, plane figures, simple solids and truncated solids - prism, pyramid, cylinder, and cone – free hand sketching of orthographic views from isometric views of objects.	

List of Experiments:	30 Hours
1. Construction of cycloid. 2. Projection of Lines inclined to both the reference planes. 3. Projection of Planes inclined to both the reference planes. 4. Projection of solids with axis inclined to one reference plane and parallel to the other plane. 5. Development of lateral surface of the sectioned solids. 6. Projection of orthographic views of the given isometric view of the objects.	
Total :L : 45 + P :30 = 75	

Suggested Learning Resources
Text Books: 1. K.Venugopal and V.Prabhu Raja, “Engineering Graphics”, New Age International (P) Limited, 2022. 2. K. V.Natarajan, “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2018.
Reference Books: 1. N.D.Bhatt and V.M.Panchal, “Engineering Drawing”, Charotar Publishing House, 53rd Edition, 2014. 2. K.R.Gopalakrishna., “Computer Aided Engineering Drawing” (Vol I and II combined) Subhas Stores, Bangalore, 2017. 3. Luzzader, Warren.J., and Duff, John M, “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production”, Eastern Economy Edition, Prentice Hall of India Pvt Ltd, New Delhi, 2005. 4. M.B.Shah and B.C.Rana, “Engineering Drawing”, Pearson, 2nd Edition, 2009.

INTRODUCTION TO CHEMICAL ENGINEERING							
Course Code:		26CHC01			CIE		40
Course Type: (Theory)		Introduction to Chemical Engineering			ESE		60
L:T:P:C		3	0	0	3	Total Marks	100
Total Hours of Pedagogy		45			Exam Hours		3
Pre—requisites		NIL					
Course Objectives:							
To Introduce chemical engineering fundamentals in unit processes and operations, problem—solving and industrial applications, building a foundation for advanced study.							
Course Outcomes						Cognitive Level	Weightage of COs in ESE
CO1	Explain the scope and significance of chemical engineering and apply appropriate symbols for flow diagram.					Apply	20%
CO2	Apply problem—solving strategies, units and physical quantities in chemical process industries.					Apply	20%
CO3	Apply the fundamental principles in fluid flow and mass transfer and their application.					Apply	20%
CO4	Apply the fundamental principles in reaction engineering and heat transfer in chemical process systems.					Apply	20%
CO5	Interpret process flow sheets and relate the roles of chemical engineers in diverse process industries.					Apply	20%

Mapping of COs with POs / PSOs													
COs	POs											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 1	3	2										2	
CO 2	3	2										2	
CO 3	3	2										2	
CO 4	3	2										2	
CO 5	3	2										2	
CO (W.A)	3	2										2	

Unit 1: CHEMICAL ENGINEERING AND PROCESS INDUSTRIES	(9)
Chemical Engineering: Definition, scope and significance of chemical engineering — The role and impact of chemical engineers in society — The chemical engineering profession and its integration with other engineering disciplines — Career opportunities and future trends in chemical engineering. Chemical Process Industries: Introduction to chemical processing — Characteristics and classification of chemical processes — Overview of major chemical process industries — Representing Chemical Processes Using Process Diagrams.	

Unit 2: PROCESS ENGINEERING CALCULATIONS AND PHYSICAL QUANTITIES	(9)
Engineering Problem Solving: Strategies for Solving Problems, Ethical Considerations in Solving Problems, The use of teams in solving problems Physical Quantities and Units: Fundamental and derived physical quantities — Systems of units (SI and other engineering unit systems)— Unit conversions and conversion factors — Important process variables such as mass, volume, density, specific gravity, temperature, pressure, flow rate and concentration.	
Unit 3: FLUID FLOW AND MASS TRANSFER FUNDAMENTALS	(9)
Fluid Flow: Introduction to fluids and fluid properties — Concept of pressure and pressure measurement — Fluid statics — Principles of fluid flow — Types of fluid flow. Mass Transfer: Fundamentals of mass transfer — Molecular diffusion and Fick's law (introductory concepts) — Convective mass transfer — Mass transfer across phase boundaries — Industrial applications of mass transfer operations.	
Unit 4: FUNDAMENTALS OF REACTION ENGINEERING AND HEAT TRANSFER	(9)
Reaction Engineering: Introduction to chemical reactions and reactors — Classification of chemical reactions — Concepts of reaction rate and rate expressions — Factors affecting reaction rates. Heat Transfer: Introduction to heat transfer and energy balances — Steady-state energy balance for open systems — Applications of steady-state energy balances — Modes of heat transfer — Fundamentals of heat exchange devices and their applications.	
Unit 5: APPLICATION OF CHEMICAL ENGINEERING	(9)
Applications of Chemical Engineering: Overview of chemical process industries — Applications in petroleum refining, petrochemicals, fertilizers, polymers, pharmaceuticals, food and beverage processing, biotechnology, pulp and paper, cement and specialty chemicals. Chemical Process Case Studies: Case study approach to chemical engineering practice — Process description and flow sheet interpretation — Manufacture of aspirin and xylene.	
Total (L : 45)	

Suggested Learning Resources
Text Books : 1. Kenneth A. Solen and John N. Harb, Introduction to Chemical Engineering Tools for Today and Tomorrow, 5th Edition, John Wiley & Sons Inc, 2010. 2. S. Pushpavanam, Introduction to Chemical Engineering, 1st Edition, Prentice Hall India, 2012.
Reference Books: 1. David M. Himmelblau and James B. Riggs, Basic Principles and Calculations in Chemical Engineering, 7th Edition, Prentice Hall India, 2003. 2. Badger W.L. and Banchero J, Introduction to Chemical Engineering, 26th Edition, Tata McGraw Hill, 2011. 3. W.L. McCabe, J. C. Smith and P. Harriot, Unit operations in Chemical Engineering, 7th Edition, Tata

McGraw Hill, 2017.

4. T Randolph Norris Shreve and George T. Austin, Shreve's Chemical Process Industries, 5th Edition, Tata McGraw Hill, 2012.
5. Gopala Rao M. and Marshall Sittig, Dryden's Outlines of Chemical Technology, 3rd Edition, East—West Press, 2008.

ENGLISH COMMUNICATION LAB

(Common to all branches)

Course Code:	26EYP01				CIA	60
Course Type: (Theory/Practical/Integrated)	Practical				ESE	40
L:T:P:C	0	0	4	2	Total Marks	100
Total Hours of Pedagogy	60				Exam Hours	3
Pre-requisites	Nil					
Course Objectives						
• Apply listening, speaking, reading, and writing skills in professional communication contexts. • Express ideas effectively in real-world professional scenarios using integrated LSRW skills.						
Course Outcomes					Cognitive Level	Weightage of COs in ESE
CO 1	Employ effective Communication in academic and professional environments.				Ap	20
CO 2	Demonstrate improved listening, speaking, reading, and writing competencies.				Ap	20
CO 3	Participate confidently in interpersonal, workplace, and group interactions.				Ap	20
CO 4	Apply digital and AI-assisted tools for professional communication tasks.				Ap	20
CO 5	Develop ideas clearly and perform effectively in real-world communication scenarios.				C	20

Mapping of COs with POs / PSOs

COs	Pos											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 1								2	3		2		
CO 2								2	3		2		
CO 3								2	3		2		
CO 4								2	3		2		
CO 5								2	3		2		
CO (W.A)								2	3		2		

Module - I :COMMUNICATION FOUNDATIONS

12

Grammar –Adjectives - **Listening** -Audio-Based Diagram Interpretation and Labelling – **Speaking** - Structured Self-Introduction– **Reading** -Reading and Interpreting Motivational and Inspirational Passages – **Writing** -Drafting Formal Permission Letters (*Industrial Visit / In-Plant Training Requests*)

Module - II :PROFESSIONAL CORRESPONDENCE	12
Grammar –Verbs- Listening - Listening to Iconic Speeches and Transcript Preparation – Speaking -Flash Speak (JAM – Just A Minute) – Reading -Critical Reading of Newspaper Editorials – Writing -Professional E-mail Writing	
Module - III :COMMUNICATION IN PRACTICE	12
Grammar –Tenses- Listening -Audio-Visual News Analysis and Reporting English Marathon – 30 Day Speaking Challenge – Speaking - Engineering Problem Identification and Solution Presentation– Reading – Inferential and Analytical Reading Practice– Writing -Writing Instructions and Procedural Guideline	
Module - IV :INTERPERSONAL COMMUNICATION	12
Grammar –WH and Yes/No Questions - Listening - Listening for Specific Information – Gap Filling Activities – Speaking - Role Play for Workplace and Real-Life Situations– Reading - Cloze Reading for Language Accuracy and Contextual Understanding – Writing -Developing Hints into Structured Paragraphs	
Module - V : PROFESSIONAL PRESENTATION SKILLS	12
Grammar –Discourse Markers- Listening -Listening to TED Talks and Expert Presentations - Note-Making and Idea Summarization – Speaking –Elevator Pitch - Professional Storytelling Techniques – Reading - Visual Interpretation and Information Analysis - Reading Infographics, Charts, and Visual Data – Writing - Engineering Process Description.	

Suggested Learning Resources
Text Books : 1. Meenakshi Raman and Sangeeta Sharma. "Professional Communication", Oxford University Press, 2023. 2. Rizvi M. Ashraf. "Effective Technical Communication", McGraw Hill Education (India) Pvt. Ltd., 2021.
Reference Books:
1. Guffey Mary Ellen and Loewy Dana. "Essentials of Business Communication", Cengage Learning, 2023. 2. Raman M. and Sharma S. "Technical Communication: Principles and Practice", Oxford University Press, 2022. 3. Murphy Raymond. "English Grammar in Use", Cambridge University Press, 2022. 4. Butterfield Jeff. "Soft Skills for Everyone", Cengage Learning, 2021. 5. TyagiKavita and Misra Padma. "Advanced Technical Communication", PHI Learning Pvt. Ltd., 2020.

Makerspace (Product Design and Manufacturing Laboratory)

(Common to All Branches)

Course Code:	26GEP02				CIA	100
Course Type: (Theory/Practical/Integrated)	Practical				ESE	-
L:T:P:C	0	0	4	2	Total Marks	100
Total Hours of Pedagogy	60				Exam Hours	-
Pre-requisites	Nil					

Course Objectives

To apply the basic knowledge of Computer-Aided Design (CAD), manufacturing processes, and 3D printing technology to develop a functional prototype model through hands-on practice.

Course Outcomes

The students will be able to

		Cognitive Level	Weightage of COs in ESE
CO 1	Sketch and develop basic component designs from innovative ideas.	Ap	-
CO 2	Develop 3D CAD models for digital prototyping.	Ap	-
CO 3	Operate basic fabrication tools and equipment safely to develop simple prototype components.	Ap	-
CO 4	Perform machining and manufacturing operations to produce prototype parts with specified dimensions.	Ap	-
CO 5	Fabricate and assemble components to produce functional prototype models.	Ap	-

Mapping of COs with POs / PSOs

COs	POs											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 1	3		3		2			2			2		
CO 2	3		3		3			2			2		
CO 3	2		3		2			2		2	2		
CO 4	3		3		2			2		2	2		
CO 5	2		3		2			3	3	2	2		
CO (W.A)	2.6		3		2.2			2.2	3	2	2		

List of Experiments:

PART A – Product Design Lab

1. Select a simple product idea.
2. Prepare freehand sketches (top, front, and side views) with component detailing.
3. Develop 3D CAD models of the components using CAD software.
4. Convert the CAD model to STL format and perform engineering analysis.

5. Fabricate the component using a 3D printer.
6. Perform post-processing to improve the quality, appearance, and functionality of the printed component.

PART B – Manufacturing Lab

1. Product Ideation and Design.
 - Select a simple innovative product.
 - Prepare freehand sketches with component detailing.
2. Manufacturing of Components.
 - Prepare a simple process plan and select suitable materials.
 - Manufacture components using appropriate workshop machines (CO₂ laser cutter, CNC wood router, lathe-cum-milling machine, and power tools).
3. Joining and Assembly.
 - Join the components using suitable joining processes (welding, riveting, or adhesive bonding).
 - Assemble the components into a functional product.
4. Testing and Evaluation.
 - Perform basic performance evaluation.
 - Conduct functional testing of the assembled product.

Total = P : 60

Suggested Learning Resources

Text Books:

- 1) Wang, W. (2010). Reverse engineering: Mechanisms, structures, systems & materials. CRC Press.
- 2) Stephen Christena, Learn to Weld: Beginning MIG Welding and Metal Fabrication Basics, Crestline Books, 2014.
- 3) H. Lipson, Fabricated - The New World of 3D Printing, Wiley, 1st edition, 2013.

Reference Books:

- 1) Makerspace (Product Design and Manufacturing Laboratory Manual)

Software:

- 1) Fusion 360

YOGA FOR YOUTH EMPOWERMENT

(Common to All Branches)

Course Code:	26GYP01				CIA	100
Course Type: (Theory/Practical/Integrated)	Practical				ESE	-
L:T:P:C	0	0	2	1	Total Marks	100
Total Hours of Pedagogy	30				Exam Hours	-
Prerequisite	Nil					
Course Objectives						
1. To develop students' character and ethical values through value-based education. 2. To apply yogic principles and healthy lifestyle practices to enhance physical well-being and maintain youthfulness.						
Course Outcomes The students will be able to					Cognitive Level	Weightage of COs in ESE
CO 1	Apply yoga and physical exercises for a healthy life.				Ap	Internal Assessment
CO 2	Explain the principles of Kayakalpa for maintaining health and youthfulness.				U	
CO 3	Practice meditation techniques for mental well-being.				Ap	
CO 4	Demonstrate individual and social values in daily life.				Ap	
CO 5	Analyze the importance of introspection and moral values for personal development				An	

Mapping of COs with POs / PSOs

COs	POs											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 1						2	1				2		
CO 2										2	3		
CO 3						2	1	2			3		
CO 4						2	2	3	2	2	3		
CO 5										2	3		
CO (W.A)						2	1	2	1	2	3		

Unit- I : Physical Health

6

Sky – Introduction – Education as a means for Youth Empowerment – Greatness of Education – Yoga for Youth Empowerment. Simplified Physical Exercise Explanation – Hand, Leg, Breathing and Eye exercises – Kapalabathi, Makarasanam, Massaging, Acupressure and Relaxation practices – Benefits, Pranayamam: Nadi Saddhi – Clearance – Explanation Benefits.

Unit- II : Strengthening Life Force	6
Reasons for Diseases: Natural Reasons – Artificial Reasons, Philosophy of Kayakalpa – Physical Body – Sermlinal Fluid – Life Force – Biomagnetism – Mind, Maintaining Youthfulness – Postponing Aging – Transformation of food into Seven Body Constitutes Greatness of Sermlinal fluid, Limit and method in five factors - Managing infatuation, Kayakalpa Practice – Toning up of nerves – Ojas Breathing – Benefits.	
Unit- III :Wellness of Mind	6
Classification of mind waves – Agna Meditation - Benefits, Shanthi meditation – Benefits, Thuriya meditation – Benefits. Blessing and its benefits : Auto suggestion – Blessing the family and others – Blessing the World – Divine Protection.	
Unit- IV : Virtues : Individual virtues	6
Self Control – Self Confidence – Speaking truth, Contentment - Humility – Mind Control., Tolerance – Adjustment – Sacrifice – Forgiveness, Cleanliness - External, Mental, Inner Cleanliness. Societal Virtues: Ahimsa – Service, Patriotism – Equality, Respecting the parents and elders – Caring for them – Respecting Teachers, Punctuality – Time management.	
Unit- V : Morals	6
Importance of Introspection : I and Mine, Six temperaments: Greed – Anger – Miserliness – Immoral Sexual Passion – Inferior Superior Complex – Vengeance, Manovering the Six Temperaments: Contentment – Tolerance - Charity – Parity – Forgiveness, Five important Benefits of Meditation, Perspicacity – Magnanimity – Adaptability – Receptivity – Creativity, Enhancing Memory – Effective Examination Preparation.	
Total (P : 30)	

Web links and Video Lectures (e-Resources):

www.vethathiri.edu.in

Fourier Analysis and Partial Differential Equations (Common to Civil , Chemical, Agri & Mechanical)

Course Code:	26MYB02				CIA	40
Course Type: (Theory/Practical/Integrated)	Theory				ESE	60
L:T:P:C	3	1	0	4	Total Marks	100
Total Hours of Pedagogy	60				Exam Hours	3
Pre-requisites	Nil					

Course Objectives

1. To introduce Fourier Series, Fourier Transforms and their applications in harmonic analysis, and engineering problem solving.
2. To develop the ability to solve ordinary and partial differential equations using Laplace Transform techniques and apply them to vibrations, and heat transfer.

Course Outcomes		Cognitive Level	Weightage of COs in ESE
CO 1	Apply Fourier Series techniques to represent periodic functions and perform harmonic analysis.	Ap	20
CO 2	Use Fourier Transform techniques to solve engineering problems involving signal analysis, transport processes, and dynamic system behavior.	Ap	20
CO 3	Solve ordinary differential equations using Laplace Transform methods and interpret engineering system responses.	Ap	20
CO 4	Apply Partial Differential Equation techniques to solve problems involving vibrations of strings and membranes.	Ap	20
CO 5	Analyze wave propagation and heat transfer problems using partial differential equations in engineering systems.	An	20

Mapping of COs with POs / PSOs

COs	POs											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 1	3				2						2		
CO 2	3				2						2		
CO 3	3				2						2		
CO 4	3				2						2		
CO 5		2			2						2		
CO (W.A)	3	2			2						2		

Unit- I : FOURIER SERIES

(9+3) Hours

Dirichlet's condition – Fourier series: Half range sine series – Half range cosine series – Parseval's identity for half range series – Root mean square value of a function – Harmonic analysis.

Unit- II : FOURIER TRANSFORMS	(9+3) Hours
Fourier integral theorem(Statement only) – Fourier transform pair - Sine and Cosine transforms – Properties -Transforms of simple functions – Convolution theorem – Parseval’s identity(Excluding proof).	
Unit- III : LAPLACE TRANSFORM	(9+3) Hours
Condition for existence - Transforms of Elementary functions –Basic Properties- First & Second Shifting Theorems (Statement only) - Initial and Final value Theorems. Inverse Laplace transforms -Convolution theorem (Excluding proof) - Solution of linear second order ordinary differential equations with constant coefficients using Laplace transform.	
Unit- IV : PARTIAL DIFFERENTIAL EQUATIONS	(9+3) Hours
Formulation of partial differential equations by eliminating arbitrary constants and functions – Solution of standard types first order partial differential equations of the type $f(p,q)=0$, Clairaut’s form – Lagrange’s linear equations – Linear partial differential equation of second and higher order with constant coefficient of homogeneous types.	
Unit- V : APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS	(9+3) Hours
Classification of second order quasi linear partial differential equations – Solution of one dimensional wave equation (Zero and non-zero velocity) – One dimensional heat equation (Temperature reduced to zero and non zero boundary conditions) – Steady state solution of two dimensional heat equation(Finite and infinite plate).	
Total (L+T : 60)	

Suggested Learning Resources
Text Books :
1. B. S. Grewal, Higher Engineering Mathematics , 45th Edition, Khanna Publishers, 2023. 2. Erwin Kreyszig, Advanced Engineering Mathematics, 11 th Edition, Wiley India, 2025.
Reference Books:
1. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics –5th Edition, Narosa Publishing House, 2016. 2. Alan Jeffrey, Advanced Engineering Mathematics, 2nd Edition, Academic Press, 2002. 3. Louis A. Pipes and Lawrence R. Harvill , Applied Mathematics for Engineers and Physicists , 3rd Edition, McGraw Hill Education, 2014. 4. Stanley J. Farlow, Partial Differential Equations for Scientists and Engineers, Revised Edition, Dover Publications, 1993. 5. James Ward Brown and Ruel V. Churchill , Fourier Series and Boundary Value Problems, 7th Edition, McGraw Hill Education, 2006.

PHYSICS FOR INDUSTRIAL SYSTEM			
Course Code:	26PYB03	CIA	40
Course Type: (Theory/Practical/Integrated)	Theory	ESE	60
L:T:P:C	3 : 0 : 0 : 3	Total Marks	100
Total Hours of Pedagogy	45	Exam Hours	3 hr
Pre-requisites	Nil		
Course Objectives			
1. Understand the structure, properties, and applications of engineering materials used in industrial systems. 2. Apply principles of thermal physics, fluid mechanics, and instrumentation in agricultural and chemical processes. 3. Analyze modern energy technologies and advanced physics concepts for sustainable industrial applications.			
Course Outcomes		Cognitive Level	Weightage of COs in ESE
CO 1	Apply the knowledge of structure and properties of engineering materials to select suitable materials for industrial applications.	Ap	20%
CO 2	Apply thermodynamic principles and heat transfer concepts in process industries.	Ap	20%
CO 3	Analyze fluid behavior and instrumentation techniques for industrial systems.	An	20%
CO 4	Apply renewable energy and environmental monitoring technologies to address industrial and sustainability challenges.	Ap	20%
CO 5	Analyze the relationship between the properties of advanced engineering materials and their applications in modern engineering technologies.	An	20%

Mapping of COs with POs / PSOs													
COs	POs											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 1	3	2											1
CO 2	3	3					1						
CO 3	3	2											
CO 4	3	2										2	
CO 5	3	2				1	1						
CO(W.A)	3	3				1	1					2	1

Unit- I : Properties of Engineering Materials	9 Hours
Crystal structure and bonding – Crystal systems and unit cells – Atomic bonding in solids – Mechanical properties of materials – Elasticity, plasticity and toughness – Thermal expansion and thermal stress – Corrosion and prevention techniques – Polymers, composites and ceramic materials – Smart materials and industrial applications.	
Unit- II : Thermal Physics	9 Hours
Laws of thermodynamics – Zeroth, First and Second laws – Heat transfer: conduction, convection and radiation – Heat conduction analyze for compound materials- Thermal conductivity of materials – Heat exchangers and insulation materials – Thermal conductivity of bad conductor- Applications in food processing and chemical industries.	
Unit- III : Fluid Physics and Instrumentation	9 Hours
Properties of fluids and fluid dynamics – Bernoulli’s principle and flow measurement – Sensors and transducers – Pressure, temperature and humidity sensors-Viscosity – Poiseuille's flow – Optical and electronic instrumentation – Applications in irrigation systems and process industries.	
Unit- IV : Energy Physics and Environmental Applications	9 Hours
Renewable energy sources – Solar thermal and photovoltaic systems – Bioenergy and biomass conversion – Environmental pollution monitoring techniques – Energy management in agriculture and chemical plants.	
Unit- V : Engineering Materials	9 Hours
Composites – Fibre Reinforced Plastics (FRP) – Fiber Reinforced Metals (FRM) – Fiber Reinforced Bricks (FRB) - Shape memory alloys – Ceramics – Thermal, Mechanical, Electrical and Chemical properties –3D printed construction materials - Nano materials.	

Suggested Learning Resources
Text Books : 1. M. N. Avadhanulu and P. G. Kshirsagar,(2024), Engineering Physics, S. Chand Publishing. 2. Yunus A. Çengel and Afshin J. Ghajar, (2020), Heat and Mass Transfer: Fundamentals and Applications, 6th Edition, McGraw-Hill Education.
Reference Books: 1. S. O. Pillai, (2019), Applied Physics for Engineers, New Age International Publishers. 2. John Twidell and Tony Weir, (2021), Renewable Energy Resources, 4th Edition, Routledge. 3. A. K. Sawhney, (2015), A Course in Electrical and Electronic Measurements and Instrumentation, Dhanpat Rai Publications. 4. P. K. Nag, (2021), Engineering Thermodynamics, McGraw Hill Education. 5. Stephen Peake, (2018), Renewable Energy: Power for a Sustainable Future, Oxford University Press.

தமிழரும் தொழில்நுட்பமும் - TAMILS AND TECHNOLOGY
(Common to All Branches)

Course Code:	26GYA02				CIA	40
Course Type: (Theory/Practical/Integrated)	Theory				ESE	60
L:T:P:C	1	0	0	1	Total Marks	100
Total Hours of Pedagogy	15				Exam Hours	3
Prerequisite	Heritage of Tamils					
பாடத் திட்டத்தின் நோக்கம்						
1.பழந்தமிழிடிமிருந்த அறிவியல் தொழில்நுட்பங்களை மாணவர்களுக்கு உரைத்தல்.						
Course Outcomes The students will be able to					Cognitive Level	Weightage of COs in ESE
CO 1	நூல் நூற்றல், சாயமிடல், பானை வனைதல், தமிழ் பிராமி எழுத்துவடிவங்களை மாணவர்களுக்கு உணர்த்துதல்.				An	20%
CO 2	வீடு, கோவில், கட்டுமான வடிவமைப்பு, காலந்தோறும் மாறிவரும் நுட்பங்களை அறிதல்.				U	20%
CO 3	இரும்பு பயன்பாடு, நாணய வடிவமைப்பு, மணி உருவாக்குதலின் தொழில்நுட்பங்களை அறிதல்.				U	20%
CO 4	நீர்மேலாண்மை, பயிர் சாகுபடி, கடல் வளம் உணர்தல்.				R	20%
CO 5	தமிழ்மொழியை கணினிவழி பயன்படுத்தும் உத்திகளை தெரிந்து கொள்ளுதல்.				U	20%

அலகு 1 நெசவு மற்றும் பானைத் தொழில்நுட்பம்	3
நெசவுத்தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்	
அலகு 2 வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்	3
சங்ககாலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் - சிலப்பதிகாரத்தில் மேடை அமைப்பு - மாமல்லபுரம் சிற்பங்களும் கோவில்களும் - தஞ்சை பெரியகோயில் - மதுரை மீனாட்சி அம்மன் ஆலயம் - செட்டிநாட்டு வீடுகள் - சென்னையில் இந்தோசாரோசெனிக் கட்டிடக்கலை	
அலகு 3 உற்பத்தி தொழில்நுட்பம்	3
கப்பல்கட்டும் கலை - இரும்பு உருக்குதல் - நாணயங்கள் அச்சடித்தல் - கல்மணிகள், கண்ணாடி மணிகள், சுடுமண் மணிகள், சங்கு மணிகள் - தொல்லியல்	
அலகு 4 வேளாண்மை மற்றும் நீர்பாசனத் தொழில்நுட்பம்	3
கல்லணை - சோழர்கால குமிழித்தூம்பு - வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - முத்துக் குளித்தல்	

அலகு 5 அறிவியல் தமிழ் மற்றும் கணினித்தமிழ்	3
அறிவியல் தமிழின் வளர்ச்சி – தமிழ்மென்பொருட்கள் உருவாக்கம் – தமிழ்மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத்திட்டம் – தமிழரும் செயற்கை நுண்ணறிவும்	
TOTAL(L:15)	

Suggested Learning Resources
Text Books – CUM- Reference Books
1. கே.கே.பிள்ளை – தமிழகவரலாறு – மக்களும் பண்பாடும்- வெளியீடு : தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம் 2. முனைவர் இல.சுந்தரம் – கணினித்தமிழ்- விகடன் பிரசுரம் 3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் – தொல்லியல்துறை வெளியீடு- 4. பொருதை – ஆற்றங்கரை நாகரிகம் – தொல்லியல்துறை வெளியீடு 5. Dr.K.K.Pillay - Social life of Tamils, A join publication of TNTB & ESC and RMRL - (in print) 6. Dr.K.K.Pillay - Studies in the History of India with special reference to Tamil Nadu.(Published by: The Author) 7. Keeladi – ‘Sangam City Civilization on the Banks of River Vaigai’ (Jointly published by : Departmental Archaeology& Tamil Nadu text book and Educational Service Corporation, Tamilnadu) 8. Dr. S. V. Subrahmanian, Dr.K.D. Thirunavvukarasu - Historical Heritage of Tamils - Published by : International Institute of Tamil Studies 9. Dr. K.S. Kuppusamy, AI Vasiyak kalai – Zero Degree Publishing, 2025.

CLIMATE CHANGE AND SUSTAINABILITY

(Common to All Branches)

Course Code:	26CYB04				CIA	40
Course Type: (Theory/Practical/Integrated)	Theory				ESE	60
L:T:P:C	2	0	0	2	Total Marks	100
Total Hours of Pedagogy	30				Exam Hours	3 HOURS
Pre-requisites	NIL					
Course Objectives						
- To develop students ability to analyze environmental systems, including resources, ecosystems, biodiversity, and pollution, and evaluate the impact of human activities. - To prepare students to design sustainable solutions using principles of conservation, environmental management, and environmental laws for addressing global and local challenges.						
Course Outcomes					Cognitive Level	Weightage of COs in ESE
CO 1	Evaluate natural resources for sustainable use and conservation.				E	20%
CO 2	Investigate biodiversity values in real-world management practices.				An	20%
CO 3	Implement eco-friendly practices for pollution prevention.				Ap	20%
CO 4	Analyze sustainable practices and environmental management strategies for sustainable development.				An	40%
CO 5	Apply sustainable practices for conservation, pollution control, and biodiversity protection in a mini-project addressing climate change impacts.				Ap	Internal Assessment

Mapping of COs with POs / PSOs

COs	POs											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 1	2					2							
CO 2	2					2							
CO 3	2		2			2							
CO 4		2	2			2							
CO 5		2	2			2							
CO (W.A)	2	2	2			2							

UNIT- I : NATURAL RESOURCES AND CLIMATE CHANGE

6

Environment - scope and importance - Natural resources - forest resources - deforestation - causes - effects - control measures - mineral resources - environmental effects of extracting and using mineral resources - food resources - effects of modern agriculture - fertilizer - pesticide problems - role of an

individual in conservation of natural resources - Climate change - causes - effects - control measures - importance and applications of AI in climate change.	
UNIT- II : ECOSYSTEMS AND BIODIVERSITY	6
Ecosystem - structure and function of an ecosystem - forest ecosystem - food chains - food webs - Biodiversity - value of biodiversity - consumptive use values- productive use values - social values - ethical values - aesthetic values - hotspots of biodiversity - threats to biodiversity - habitat loss - poaching - conservation of biodiversity - In-situ - Ex-situ conservation of biodiversity - effects of climate change on biodiversity and ecosystems.	
UNIT- III : ENVIRONMENTAL POLLUTION	6
Pollution - causes - effects and control measures of air pollution - water pollution - noise pollution - ozone layer depletion - acid rain - solid waste management - methods of disposal of solid waste - land filling - incineration - composting - effects of climate change on environmental pollution.	
UNIT- IV : SUSTAINABILITY AND MANAGEMENT	6
Sustainable development - factors affecting development - sustainable energy techniques - hydrogen energy - solar energy - wind energy - water conservation techniques - rainwater harvesting - GDP - types - nominal GDP - real GDP - components of GDP - expenditure approach - carbon credit - carbon footprint - sources - preventive measures – environmental management.	
UNIT- V : SUSTAINABILITY PRACTICES	6
Zero waste and R concept - circular economy concepts - green chemistry - principles - environmental impact assessment - carbon emission - sources - effects - control measures - Environmental laws and regulations - air act - water act - role of AI in sustainability practices.	
Total (L : 30)	

Suggested Learning Resources
Text Books :
1. Dr. A.Ravikrishan, Environmental Science and Engineering, Sri Krishna Hitech Publishing Co. Pvt.Ltd., Chennai,15thEdition, 2023. 2. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 8th Edition, New Age International Publishers, 2025.
Reference Books:
1. Rajagopalan R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, Fourth Edition, 2023. 2. Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2025. 3. G. Tyler Miller Jr. and Scott Spoolman, Environmental Science, 17th Edition, Cengage Learning, Boston, 2024. 4. Bala Krishnamoorthy, Environmental Management: Text and Cases, 2nd Edition, PHI Learning Pvt.

Ltd., New Delhi, 2023.

5. Paul T. Anastas and John C. Warner, Green Chemistry: Theory and Practice, Oxford University Press, New York, Reprint Edition, 2023.

BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING							
Course Code:		26EEC03				CIA	40
Course Type: (Theory/Practical/Integrated)		Theory				ESE	60
L:T:P:C		3	0	0	3	Total Marks	100
Total Hours of Pedagogy		45				Exam Hours	3
Pre-requisites		NIL					
Course Objectives							
- To develop fundamental knowledge of electrical and electronic engineering concepts through DC circuits, AC circuits, electrical machines, wiring systems, semiconductor devices, and digital electronics. - To apply electrical and electronic engineering principles for analyzing simple domestic and industrial engineering applications.							
Course Outcomes						Cognitive Level	Weightage of COs in ESE
CO 1	Apply the fundamental principles and laws to solve basic DC and AC circuit problems.					Ap	20%
CO 2	Analyze the characteristics of DC machines, transformers, and AC machines.					An	20%
CO 3	Apply basic electrical wiring techniques and safety practices for residential electrical installations.					Ap	20%
CO 4	Recommend a suitable semiconductor devicefor a basic electronic circuit design.					Ap	20%
CO 5	Design basic digital electronic circuits using Boolean algebra techniques for Arduino, IoT, and renewable energy applications.					Ap	20%

Mapping of COs with POs / PSOs													
COs	POs											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 1	3	3	3										
CO 2	3	2	2										
CO 3	3	2				1							
CO 4	3	2											
CO 5	3	2											
CO (W.A)	3	2	2.5			1							

Unit- I : BASIC ELECTRICAL CIRCUITS	9
Electrical quantities and circuit elements(R, L and C)– Ohm’s Law – Kirchhoff’s Laws – Series and parallel circuits – Electrical power and energy – Introduction to DC and AC supply systems.	
Unit- II :ELECTRICAL MACHINES	9

DC Machines: Construction, principle of operation, types and applications – Single phase transformer: Construction, principle of operation and applications – AC Machines: Construction, principle of operation and applications of single phase induction motor, three phase induction motor, and synchronous motor.	
Unit- III :HOUSE WIRING AND ELECTRICAL SAFETY	9
Single phase and three phase systems – Phase, Neutral and Earth – Basic house wiring – Wiring tools and accessories – Staircase wiring – Ceiling fan and lamp connections – MCB and RCCB – Basic load calculation - Electrical safety practices in homes and industries.	
Unit- IV : ELECTRONIC DEVICES AND APPLICATIONS	9
Introduction to semiconductor devices – PN junction diode – Zener diode – BJT transistor – LED – Operational amplifier – Applications in rectifier, switching and simple control circuits – Introduction to sensors and smart devices.	
Unit- V :DIGITAL ELECTRONICS AND EMERGING TECHNOLOGIES	9
Number systems – Binary arithmetic – Logic gates – Boolean algebra – Adder and subtractor circuits – Introduction to Arduino, IoT and renewable energy systems.	
Total (L : 45)	
Suggested Learning Resources	
Text Books :	
1. D. P. Kothari and I. J. Nagrath, Basic Electrical and Electronics Engineering, 2nd Edition, McGraw Hill, 2020.	
2. Ritu Sahdev “Basic Electrical Engineering”1st Revised Edition, Khanna Book Publishing Co,2020.	
Reference Books:	
1. Jr., William H. Hayt, Kemmerly, Jack E.Phillips, Jamie D.Durbin, Steven M. “Engineering Circuits Analysis”,10th edition., Tata McGraw Hill publishers, New Delhi, 2024.	
2. Charles Alexander and Mathew Sadiku, ‘Fundamentals of Electric Circuits’. Tata McGraw Hill, New Delhi, 2021	
3. R Muthusubramanian and S Salivahanan, “Basic Electrical and Electronics Engineering,education” 2nd Edition, McGraw Hill, 2024.	
4. Dr. Aruna Bansal, Dr. L. Radhika Rani, Dr. N. Chandrakant Joshi, and Dr. C. Bala Subramanian, Basic Electronics Engineering, Academic Guru Publishing House, 2023.	
5. D. C. Kulshreshtha, Basic Electrical Engineering, Tata McGraw Hill, 2019.	

CHEMICAL PROCESS INDUSTRIES							
Course Code:		26CHC02			CIE	40	
Course Type: (Theory)		Chemical Process Industries			ESE	60	
L:T:P:C		3	0	0	3	Total Marks	100
Total Hours of Pedagogy		45			Exam Hours	3	
Pre-requisites		NIL					
Course Objectives:							
To develop knowledge of manufacturing process flow diagrams for inorganic, organic and polymer industries through systematic process analysis.							
Course Outcomes						Cognitive Level	Weightage of COs in ESE
CO 1	Apply unit operations and unit processes in inorganic chemical manufacturing industries.					Apply	20%
CO 2	Apply process engineering principles to cement, glass, and fuel gas manufacturing industries.					Apply	20%
CO 3	Analyze process flow diagrams and operating conditions of pulp, paper, sugar, and starch industries.					Analyze	20%
CO 4	Analyze manufacturing processes, equipment, and sustainability aspects of polymer and fertilizer industries.					Analyze	20%
CO 5	Analyze process flow sheets, equipment selection, and operational challenges in chemical process industries.					Analyze	20%

Mapping of COs with POs / PSOs													
COs	POs											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 1	3	2										2	
CO 2	3	2										2	
CO 3	3	2										2	
CO 4	3	2										2	
CO 5	2	2										2	
CO (W.A)	3	2										2	

Unit- I : FUNDAMENTALS OF CHEMICAL PROCESS INDUSTRIES AND INORGANIC INDUSTRY	9
Overview of chemical process industries: Classification of chemical industries, Process flow diagrams and block flow diagrams, Unit operations and unit processes.	
Manufacture of Inorganic Chemicals: Sulphuric acid, Nitric acid, Phosphoric acid, Soda ash and Caustic soda.	

Unit- II : CEMENT, GLASS AND FUEL GAS INDUSTRY	9
Cement manufacturing: Raw materials, clinker production, grinding — Properties of cement — Process flow diagram — Pollution control and sustainability practices. Glass industry: Types of glass — Raw materials — Properties of glass — Manufacturing process of soda-lime, borosilicate and specialty glasses. Natural gas: Classification and properties of fuel gas — Natural gas, Liquefied Natural Gas (LNG), Compressed Natural Gas (CNG) and Synthesis gas (Syngas).	
Unit- III : PULP, PAPER, SUGAR AND STARCH INDUSTRIES	9
Pulp and Paper manufacturing: Mechanical, Chemical and Semi-chemical pulping methods — Paper manufacturing process — Paper grades — Applications. Sugar and Starch industry: Sugar manufacture from sugarcane — By-products and utilization. Starch production — Starch derivatives and industrial applications.	
Unit- IV : POLYMER AND FERTILIZER INDUSTRIES	9
Polymer industries: Manufacturing of Polyethylene (LDPE & HDPE), Polypropylene, PVC, Polystyrene, ABS, SBR, Nylon and Polycarbonate, processing techniques. Fertilizer industry: Nitrogen fertilizers (Ammonia, Urea) — Phosphatic fertilizers — Single Super Phosphate (SSP) — Monoammonium Phosphate (MAP), Diammonium Phosphate (DAP) — Potassic fertilizers and NPK fertilizers.	
Unit- V : PROCESS DESIGN, EQUIPMENT SELECTION AND OPERATIONAL CHALLENGES	9
Steps involved in preparation of process flow sheets – Material and energy balance representation in flow sheets – Selection and arrangement of process equipment. Engineering troubles in process industries: Identification and analysis of common operational problems – Equipment failures and process limitations – Safety hazards and troubleshooting methods.	
Total (L : 45)	

Suggested Learning Resources
Text Books : 1. T Randolph Norris Shreve and George T. Austin, Shreve's Chemical Process Industries, 5th Edition, McGraw-Hill Education, 2012. 2. Gopala Rao M. and Marshall Sittig, Dryden's Outlines of Chemical Technology, 3rd Edition, East-West Press, 2008.
Reference Books: 1. Mark W. V. and Bhatia S. C., Chemical Process Industries, Volumes I & II, CBS Publishers, 2007. 2. Kent J. A., Riegel's Handbook of Industrial Chemistry, Springer, Latest Edition. 3. McKetta J. J., Encyclopedia of Chemical Processing and Design, CRC Press. 4. Sinnott R. K. and Towler G., Chemical Engineering Design, Elsevier. 5. Coulson J. M. and Richardson J. F., Chemical Engineering, Volumes 2 & 6, Elsevier.

ENGLISH PROFICIENCY LAB (Common to all branches)							
Course Code:		26EYP02				CIA	60
Course Type: (Theory/Practical/Integrated)		Practical				ESE	40
L:T:P:C		0	0	2	1	Total Marks	100
Total Hours of Pedagogy		30				Exam Hours	3
Pre-requisites		26EYP01					
Course Objectives							
- To improve real-time communication and interaction skills - To enhance digital, collaborative, and workplace communication							
Course Outcomes						Cognitive Level	Weightage of COs in ESE
CO 1	Communicate effectively in collaborative and workplace situations.					Ap	20
CO 2	Demonstrate fluency in professional and interpersonal interactions.					Ap	20
CO 3	Respond effectively to real-world communication contexts.					Ap	20
CO 4	Apply creative and analytical thinking in communication tasks.					Ap	20
CO 5	Create clear oral and written communications for academic, social, and professional purposes.					C	20

Mapping of COs with POs / PSOs													
Cos	Pos											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 1								2	3		2		
CO 2								2	3		2		
CO 3								2	3		2		
CO 4								2	3		2		
CO 5								2	3		2		
CO (W.A)								2	3		2		

Module - I :Interactive Communication Skills	6
Grammar –If Conditional Clauses - Listening - Listening to Engineering Project Briefings and Response Analysis- Speaking - Expressing Opinions through Agree–Disagree Circles	
Module - II :Workplace Communication	6
Grammar –Active and Passive Voice - Reading - Reading Corporate Communication Samples – Writing - Drafting LinkedIn Profile Summaries	
Module - III :Real-World Communication	6

Grammar – Synonyms & Antonyms - Listening - Listening to Travel Vlogs and Experience Narration – Speaking –Tech-Talk Video Presentation	
Module - IV : Technical Communication	6
Grammar – Articles– Reading - Reading Technology Blogs – Writing - Writing Captions for Technical Posters	
Module - V :Professional Interaction Skills	6
Grammar –Confusable Words - Listening - Listening to Interview Experiences and Career Talks – Speaking – Resolving a conflict in a team project	

Suggested Learning Resources
Text Books :
1. Sanjay Kumar and PushpLata, "Communication Skills", Oxford University Press, Third Edition, 2023. 2. Meenakshi Raman and Sangeeta Sharma, "Professional Communication", Oxford University Press, Third Edition, 2022.
Reference Books:
1. Barun K. Mitra, "Personality Development and Soft Skills", Oxford University Press, Second Edition, 2023. 2. Flatley, Marie E. and Rentz, Kathryn. "Business Communication: Connecting in a Digital World", McGraw Hill Education, 2022. 3. Murphy, Herta A., Hildebrandt, Herbert W. and Thomas, Jane P. "Effective Business Communication", McGraw Hill Education, 2022. 4. Raman, Meenakshi and Sharma, Sangeeta. "Technical Communication: Principles and Practice", Oxford University Press, 2021. 5. D. Sudha Rani, "English for Professional Communication", Pearson Education, Second Edition, 2021.

PHYSICS LABORATORY			
Course Code:	26PYP01	CIA	60
Course Type: (Theory/Practical/Integrated)	Theory	ESE	40
L:T:P:C	0 : 0 : 2 : 1	Total Marks	100
Total Hours of Pedagogy	30	Exam Hours	2 hr
Pre-requisites	Nil		
Course Objectives			
1. To infer the practical knowledge by applying the experimental methods to correlate with the Physics theory. 2. To introduce different experiments to test basics of physics concepts applied in optics and electronics.			
Course Outcomes		Cognitive Level	Weightage of COs in ESE
CO 1	Apply elasticity concepts to determine mechanical and thermal properties of materials using experimental methods.	Ap	20%
CO 2	Evaluate optical phenomena using laser, diffraction, and interference techniques.	Ev	20%
CO 3	Apply semiconductor concepts to determine band gap energy and solar cell characteristics.	Ap	20%
CO 4	Analyze electrical and magnetic properties using Ohm’s law and B–H curve experiments.	An	20%
CO 5	Apply modern physics concepts to determine Planck’s constant using electroluminescence.	Ap	20%

Mapping of COs with POs / PSOs													
COs	POs											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 1	3	2		1									
CO 2	3	3											
CO 3	3	3	1	1									
CO 4	3	2											1
CO 5	3	2										1	
CO (W.A)	3	2	1	1								1	1

LIST OF EXPERIMENTS:

1. Determination of Young's modulus by non-uniform bending method.
2. Determination of (a) wavelength and (b) particle size using Laser.
3. Determination of thermal conductivity of a bad conductor – Lee 's Disc method.
4. Determination of wavelength of mercury spectrum – spectrometer grating.
5. Determination of band gap of a semiconductor.
6. Determination of thickness of a thin wire – Air wedge method.
7. Determination of V-I characteristics of solar cell.
8. Experiments on electromagnetic induction B-H Curve experiment to determine magnetic parameter.
9. Verify Ohm's law – Series and parallel Connection.
10. Determination of Planck's constant using electroluminescence process.

TOTAL (P:30) = 30 PERIODS

ANALYTICAL SKILLS – I (Common to All Branches)													
Course Code:		26GEA01						CIA		100			
Course Type: (Theory/Practical/Integrated)		Theory						ESE		-			
L:T:P:C		2		0		0		1		Total Marks		100	
Total Hours of Pedagogy		30						Exam Hours		2.5			
Prerequisite		Nil											
Course Objectives													
1. To develop students' proficiency in quantitative aptitude by strengthening their understanding of number systems, arithmetic concepts, mathematical applications, and problem-solving techniques required for academic, competitive, and placement examinations. 2. To enhance students' logical reasoning and analytical thinking skills by enabling them to identify patterns, solve reasoning problems, analyze relationships, and apply spatial visualization techniques for effective decision-making and logical problem-solving.													
Course Outcomes The students will be able to										Cognitive Level		Weightage of COs in CIA	
CO 1		Understand and apply fundamental number theory techniques to solve quantitative aptitude efficiently.								U		20%	
CO 2		Solve basic mathematical and word problems accurately and efficiently.								AP		20%	
CO 3		Analyze and solve real-life and aptitude-based arithmetic problems effectively.								Ap		20%	
CO 4		Develop logical thinking and analytical reasoning skills for solving reasoning problems effectively.								An		20%	
CO 5		Apply analytical and spatial reasoning skills and solve analogy and image-based reasoning problems effectively.								An		20%	
Mapping of COs with POs / PSOs													
COs		POs										PSOs	
		1	2	3	4	5	6	7	8	9	10	11	1
CO 1		2	2										
CO 2		2	2										
CO 3			2	2									
CO 4			2								2		
CO 5			2								2		
CO (W.A)		2	2	2							2		

Unit- I : Number Theory and Divisibility Rules	6
Place and Face Value – Types of Numbers – Divisibility Rule – Unit Digit Concept – Remainder Theorem - Problems on HCF and LCM - Arithmetic Progression - Geometric Progression.	
Unit- II : Basic Arithmetic and Word Problems	6
BODMAS – Simplification – Problems on Numbers – Math Puzzle.	
Unit- III : Fundamentals of Arithmetic Applications	6
Percentage - Ratio and Proportion – Ages – Average.	
Unit- IV : Pattern Analysis and Logical Thinking	6
Number series - Alphabetical Series – Alphanumeric – Odd man out - Coding and Decoding.	
Unit- V : Analogy and Spatial Visualization	6
Analogy – Mirror Images – Water Images – Pattern Completion.	
Total (P : 30)	

Suggested Learning Resources
Reference Books:
1. Aggarwal R S. “Quantitative Aptitude for Competitive Examinations”, S. Chand Publishing Company Ltd(s)., 2022. 2. Sharma, Arun. “How to Prepare for Quantitative Aptitude for the CAT”, Tata McGraw – Hill Publishing, 2024. 3. Dr. R. S. Aggarwal. “A Modern Approach to Logical Reasoning”, S. Chand Publishing., 2024–2025 (revised editions used for competitive exams).
Web links and Video Lectures (e-Resources):
1. https://www.geeksforgeeks.org/aptitude/quantitative-aptitude/ 2. https://aspirantzone.in/study-materials/subject-wise-study-materials/quantitative-aptitude-study-material-practice/ 3. https://www.testmocks.com/blog/quantitative-aptitude-mock-test/ 4. https://letsstudytogether.co/quantitative-aptitude-topic-wise-questions-and-answers-pdf-download/

OPEN ELECTIVE

SUSTAINABLE ENGINEERING							
Course Code:					CIA	40	
Course Type: (Theory/Practical/Integrated)		Theory			ESE	60	
L:T:P:C		3	0	0	3	Total Marks	100
Total Hours of Pedagogy		45			Exam Hours	3 HOURS	
Pre-requisites		NIL					
Course Objectives							
- To develop students' ability to assess sustainability principles, resource management practices, and environmental challenges in engineering systems. - To prepare students to design sustainable products, manufacturing processes, and transportation systems using life cycle thinking and AI-enabled approaches.							
Course Outcomes					Cognitive Level	Weightage of COs in ESE	
CO 1	Analyze sustainability issues to support sustainable engineering solutions.				An	20%	
CO 2	Assess sustainable practices for the efficient utilization and management of natural resources.				E	20%	
CO 3	Implement sustainable manufacturing and transportation practices to improve resource efficiency and environmental performance.				Ap	40%	
CO 4	Examine life cycle assessment results to support sustainable design decisions.				An	20%	
CO 5	Undertake an individual or group-based study to develop sustainable engineering solutions using resource management, green manufacturing, sustainable transportation, and life cycle assessment.				Ap	Internal Assessment	

Mapping of COs with POs / PSOs													
COs	POs											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO 1						2					2		
CO 2						2					2		
CO 3			2			2					2		
CO 4			2		2	2					2		
CO 5						2					2		
CO (W.A)			2		2	2					2		

UNIT- I : FUNDAMENTALS OF SUSTAINABLE DEVELOPMENT	9
Concepts of sustainability and sustainable development - Historical development of sustainable engineering - Triple Bottom Line (People, Planet, Profit) - Sustainable Development Goals (SDGs) and AI applications - population growth and resource consumption - Global environmental challenges - Role of engineers in sustainable development.	
UNIT- II : SUSTAINABLE ENVIRONMENTAL RESOURCE MANAGEMENT	9
Water resources - over utilization of surface and ground water - conflicts over water - Forest resources - deforestation - causes - effects - control measures - Land resources - soil erosion - causes - control measures - Energy resources - renewable energy sources - solar energy - wind energy - Mineral resources - environmental effects of extracting and using mineral resources - Environmental management systems - Resource efficiency and productivity.	
UNIT- III : SUSTAINABLE MATERIALS AND MANUFACTURING	9
Green materials and eco-friendly products - Material life cycle analysis - Sustainable manufacturing processes - Cleaner production techniques - Industrial ecology - Green supply chain management - Circular economy concepts - AI enabled waste reduction and recycling systems.	
UNIT- IV : TRANSPORTATION AND SUSTAINABLE MOBILITY	9
Sustainable transportation systems - Public transport planning - Electric vehicles - Hybrid vehicles - Alternative fuels - Intelligent transportation systems - Traffic and environmental management - AI-driven solutions for accident prevention and road safety management.	
UNIT- V : LIFE CYCLE ASSESSMENT AND SUSTAINABLE DESIGN	9
Life Cycle Assessment (LCA) methodology - Product life cycle stages - Eco-design principles - Sustainable product development - Life Cycle Cost Analysis (LCCA) - Design for Environment - Cradle-to-cradle design - Role of AI in Life Cycle Assessment and Sustainable Design.	
Total (L : 45)	

Suggested Learning Resources
Text Books :
1. Brinkmann, R. and Bhamoriya, V., Introduction to Sustainability: An Indian Adaptation, Wiley India Pvt. Ltd., Second Edition, 2024.
2. Vasam, S. and Jagannadha Rao, K., Sustainable Engineering, S. K. Kataria & Sons, New Delhi, First Edition, Reprint 2024.
Reference Books:
1. Vallero, D. A. and Brasier, C., Sustainable Design: The Science of Sustainability and Green Engineering, John Wiley & Sons, Second Edition, 2024.
2. McDonough, W. and Braungart, M., Cradle to Cradle: Remaking the Way We Make Things, North Point Press, Updated Edition, 2022.
3. Robert Brinkmann, <i>Introduction to Sustainability</i> , 3rd Edition, John Wiley & Sons, Hoboken, NJ,

2023.

4. David A. Dornfeld, *Green Manufacturing: Fundamentals and Applications*, Springer International Publishing, Cham, Switzerland, 2023.
5. Olivier Jolliet, Myriam Saadé-Sbeih, Shanna Shaked, Alexandre Jolliet and Pierre Crettaz, *Environmental Life Cycle Assessment*, 2nd Edition, CRC Press, Taylor & Francis Group, Boca Raton, 2024.